Active Project (2014 - 2017)

Energy-Deposition to Reduce Skin Friction in Supersonic Applications, Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)

ABSTRACT

NASA has drawn attention to an impending need to improve energy-efficiency in low supersonic (M<~3) platforms. Aerodynamic efficiency is the foundation of energy-efficient flight in any regime, and low drag is one of the fundamental characteristics of aerodynamic efficiency. For supersonic aircraft, drag can be broadly decomposed into four components: viscous or skin friction drag, lift-induced drag, wave or compressibility drag, and excrescence drag. The relative impact of these four drag forces depends upon vehicle-specific characteristics and design. However, viscous skin friction drag stands out as particularly significant across most classes of flight vehicles. Therefore, effective techniques to reduce skin friction drag on a vehicle will have a major and far-reaching impact on flight efficiency for low supersonic aircraft. In an effort to address the need for increased aerodynamic efficiency of low supersonic vehicles, PM&AM Research, in collaboration with Texas A&M University, propose to build upon our successful Phase I effort to mature/develop our novel energy deposition technologies, using basic, well-demonstrated energy-deposition techniques along the surface in supersonic flow to control/compress/forcibly-move the boundary layer fluid by creating a low-density "bubble-like" region, thereby reducing the viscous skin friction. Once matured, this solution will reduce the drag experienced by a low supersonic platform, allowing vehicles to exhibit increased aerodynamic efficiency.

ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: Our technology can be used to improve the aerodynamic efficiency of a wide range of supersonic NASA programs, including access to space platforms and prototype aircraft.

To the commercial space industry:

Potential Non-NASA Commercial Applications: Our technology

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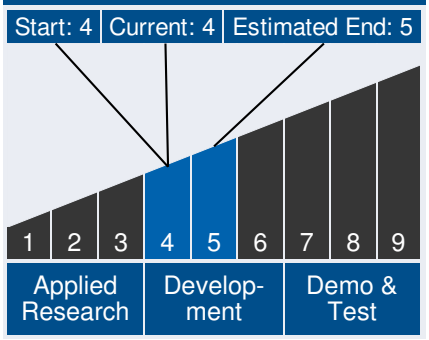
Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

Continued on following page.

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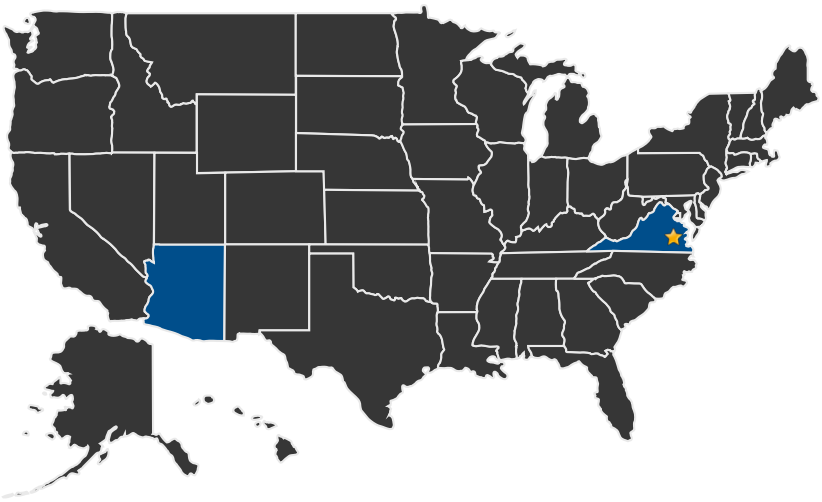
can be used to improve the aerodynamic efficiency of a wide range of supersonic Government and industry platforms including supersonic business jets, commercial and military access to space vehicles, supersonic cruise vehicles, and high-speed delivery platforms, among others

U.S. WORK LOCATIONS AND KEY PARTNERS



U.S. States With Work

Lead Center:
Langley Research Center

Other Organizations Performing Work:

- Physics, Materials, and Applied Mathematics Research, LLC (Tucson, AZ)

PROJECT LIBRARY

Presentations

- Briefing Chart
  - (http://techport.nasa.gov:80/file/22944)

Management Team *(cont.)*

Project Manager:

- Stephen Wilkinson

Principal Investigator:

- Nathan Tichenor

Technology Areas

Primary Technology Area:
Aeronautics (TA 15)
└ Ultra-Efficient Commercial Vehicles (TA 15.3)
  └ Achieve Community Goals for Improved Vehicle Efficiency and Environmental Performance in 2025 (TA 15.3.1)
    └ Demonstrate Innovative Flow Control (TA 15.3.1.1)

Secondary Technology Area:
Aeronautics (TA 15)
└ Innovation in Commercial Supersonic Aircraft (TA 15.2)

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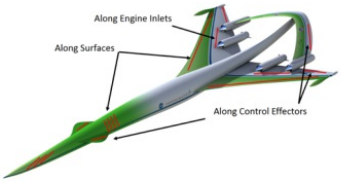
IMAGE GALLERY



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DETAILS FOR TECHNOLOGY 1

Technology Title

Energy-Deposition to Reduce Skin Friction in Supersonic Applications

Potential Applications

Our technology can be used to improve the aerodynamic efficiency of a wide range of supersonic NASA programs, including access to space platforms and prototype aircraft.